

EPA Region 5 Records Ctr. 226801

# STS CONSULTANTS, LTD.

Work Plan for Investigation and Removal of Radiologically Impacted Soil

Lakeshore East LLC One West Superior, Suite 200 Chicago, Illinois 60610

STS Project No. 1-32193-XA June 24, 2002 Revised September 13, 2002



750 Corporate Woods Parkway Vernon Hills, Illinois 60061 847-279-2500 Phone 847-279-2510 Fax

June 24, 2002 Revised September 13, 2002

Mr. Fred Micke Ms. Verneta Simon U. S. Environmental Protection Agency Region 5 77 W. Jackson Blvd., SE-5J Chicago, Illinois 60604

Re: Work Plan for Investigation and Removal of Radiologically Impacted Soil, 26-Acre Site, Southwest Corner of Wacker Drive and Lake Shore Drive, 221 North Columbus Drive, Chicago, Illinois – STS Project No. 1-32193-XA

Dear Mr. Micke and Ms. Simon:

Enclosed please find the draft Work Plan for the above-referenced site for your review and comments. Please note that SOP-320, Radioactive Material Shipments, is still in preparation. That SOP will be provided as an addendum when it is available, likely in the next week or so. We have provided two copies for your use and distribution. Following receipt of your comments, we will prepare the final Work Plan.

Please contact us with any questions or comments you may have regarding the attached Work Plan.

Regards,

STS CONSULTANTS, LTD.

Steven C. Kornder, Ph.D. Senior Project Geochemist

Richard G. Berggreen, C.P.G. Principal Geologist

cc: David Carlins, Lakeshore East, LLC Sean Bezark, Altheimer & Gray Barbara Magel, Karaganis, White & Magel



# **Table of Contents**

1.0	INTRODUCTION1					
	1.1	Back	ground	2		
2.0	PROPOSED WORK ACTIVITIES					
	2.1	Gene	eral Description	4		
	2.2	Exca	vation of Radiologically Impacted Soil (Phase I	I) 54		
	2.3	Site 0	Grading and Monitoring (Phase III)	5		
	2.4	Cons	truction Monitoring	6		
		2.4.1	Utilities	6		
		2.4.2	Foundations	76		
3.0	ME	THOD	9S	8		
	3.1	Clear	nup Threshold	8		
	3.2	Surve	eys, Sampling, and Analysis	8		
		3.2.1	Confirmation Surveys	8		
		3.2.2	Surficial Walk-over Surveys	109		
		3.2.3	Verification Sampling	1140		
	3.3	Mater	rials Management	1211		
	3.4	Data i	Management and Report	13		
	3.5 Exclusion Zone Access and Security					
	3.6	Decor	ntamination	15 <del>14</del>		
4.0	HE.	ALTH	AND SAFETY PLAN SUMMARY	16 <del>15</del>		
		•	Personnel			
	4.2 Potential Hazards					
	4.3 Training and Communications					
			nnel Protective Equipment			
			uality Monitoring			
			Personnel Exposure Monitoring			
			Perimeter Monitoring			
	CLOSURE DOCUMENTATION2120					
ഒ	REI	FREN	NOFS	2221		

# **Figures**

Figure 1 Lakeshore East Site Plan

Figure 2 Boring Location Diagram

Figure 3 Project Management Organization Chart

Figure 4 Fill Isopach Map



• .			
Λn	nan	$\alpha$	00
AU	pen	ulu	<b>C</b> 3

Appendix A	Field Gamma	Survey Form
------------	-------------	-------------

# Appendix B Standard Operating Procedures

SOP-210	Gamma Radiological Surve
SOP-212	Air Monitoring Procedure
SOP-214	Soil Sampling Procedure
SOP-215	Field Logbook Procedure
SOP-217	Excavation Procedure
SOP-223	Verification Survey

SOP-320 Radioactive Material Shipments

SOP-345 Survey for Surface Contamination and

Release of Equipment for Unrestricted

Use

SOP-347 Decontamination

SOP-364 Sample Preparation Procedure for

Gamma Spectral Analysis

SOP-366 Operation of the ACCUSPEC Gamma

Counter

SOP-372 Operation of the Ludlum Model 2000

Alpha System

Appendix C Plans

**Dust Control Plan** 

Emergency Contingency Plan
Transportation and Logistics Plan

Verification Sampling Plan

Appendix D Specifications

Section 01010 Summary of Work

Section 01020 Construction Health and Safety
Section 02010 Demolition and Debris Removal
Section 02200 Contaminated Material Loadout and

Earthwork

Section 02840 Site Utilities

Appendix E

Health and Safety Plan



# WORK PLAN FOR INVESTIGATION AND REMOVAL OF RADIOLOGICALLY IMPACTED SOIL LAKESHORE EAST DEVELOPMENT

#### 1.0 INTRODUCTION

This Work Plan was developed for investigation and removal of radiologically impacted soil from the Lakeshore East Development Site (Subject Site). The Subject Site consists of approximately 26 acres located at the southwest corner of Wacker Drive and Lake Shore Drive at 221 North Columbus Drive, Chicago, Illinois (Figure 1). The site is currently developed as Family Golf Centers at Chicago Metro, a golf course and driving range, with associated support buildings, facilities and parking lots. The Subject Site is being investigated as part of a proposed commercial and residential development.

The Work Plan describes the:

- Procedures for managing the removal of radiologically impacted soil above the 7.1 pCi/g cleanup threshold.
- Survey methods proposed for identifying radiologically impacted materials during the grading and excavation activities.
- Closure Report and Documentation of the work activities performed relating to the removal of radiologically impacted soil including health and safety procedures.

Following review and approval of this Work Plan by United States Environmental Protection Agency (USEPA), activities will begin with the removal of the radiologically impacted soils previously identified. Monitoring will be conducted concurrently with the excavation operations. The monitoring activities will be directed toward the identification of radiologically impacted materials within the excavation areas. Radiologically impacted material that is excavated will be transported to a disposal facility licensed to dispose of this material. After completion of the removal activities required by this Work Plan, a report will be prepared documenting the removal activities and indicating the location, if any, of impacted soil identified that will remain on-site. The USEPA will be requested to prepare a "Certification of Completion Letter" acknowledging the completion of the investigation and removal of impacted material. This "Certification of Completion Letter" is requested to acknowledge that conditions at the site are protective of human health and the environment and that no further remediation is necessary.





## 1.1 Background

Several properties north of the Chicago River in the Streeterville neighborhood of Chicago, Illinois have been found to exhibit evidence of radiological impacts from the former processing of thorium-bearing mineral sands by Lindsay Light and Chemical Company (Lindsay Light) during the 1910s, 20s and 30s. The radiological impacts consist of elevated concentrations of thorium, uranium and their radioactive decay products.

Due to their experience with the Lindsay Light sites the USEPA requested access and conducted a reconnaissance survey of a portion of the Subject Site. That survey identified at least two locations where the gamma radiation levels were anomalously high. Field analysis by USEPA using a portable multi-channel analyzer in areas exhibiting elevated gamma radiation identified uranium and thorium radionuclides consistent with the other Streeterville properties (USEPA correspondence, July 2, 2001).

STS was contracted to investigate the entire 26-acre property to evaluate whether additional locations exhibiting elevated radioactivity might be present, and to attempt to further investigate the USEPA survey results. STS conducted a walkover survey of the entire property on a 5-meter grid. The survey identified locations exhibiting elevated gamma radiation which were consistent with the USEPA findings. Borings, step-out borings, down-hole gamma surveys, and radiological analysis of soil samples were also conducted to document the apparent extent of the radiologically impacted material. The findings of the investigation were summarized in a report dated September 19, 2001, and in an addendum letter report dated September 28October 2, 2001.

The identification of buried radioactive materials from surface surveys is constrained by the presence of soil cover of more that about two feet that can shield radioactive material from detection. The ground surface dating from about the year 1900 was researched to establish the ground surface elevation before the industrial use of the radioactive materials was begun in the site vicinity. The apparent historical site ground surface elevation was evaluated and described in STS's report dated January 2002. Additionally, a fill thickness map was subsequently developed by comparing the year 1900 site grade to the current site topography (STS, February 2002). The resulting fill thickness map identified those areas where the fill over the 1900 ground surface was in excess of 2 feet thick and therefore could potentially mask the presence of radioactive soil from detection by a surface survey. A total of 22 (fill thickness) borings were drilled and numbered 100 through 122 (Figure 2) and were surveyed by down-hole gamma logging for



evidence of radiologically impacted soil. The borings ranged from 4 to 10 feet deep and were intended to extend a minimum of 1 foot below the 1900 ground surface elevation.

STS's review of the historical records also identified the presence of several shipping slips on the Subject Site that were filled during a period which was concurrent with the Lindsay Light manufacturing operations. The location of these slips is shown on Figure 2. Borings within the slip areas were drilled on a 10-meter grid over the entire extent of the slips as of the year 1906 to explore the slips for evidence that radiological material may have been included in the fill. A total of 215 borings were drilled to examine the slip areas in January 2002. Borings in Slips C, D, and E are designated with a letter indicating the slip and a number indicating the boring number (i.e., C-1 reflects Slip C, boring 1). The boring layout is also shown on Figure 2. Additionally, a final set of borings, step-out borings, were positioned around those slip borings where evidence of elevated gamma radiation was noted in the down-hole logging of the initial 10 meter grid borings. These step-out borings were for the purpose of identifying the lateral extent of the radiologically impacted soil noted in the slip grid boring.

The results of the additional boring activities conducted in January 2002 are included the STS report of February 8, 2002. All of the fill thickness, slip and step-out borings were surveyed for elevated radioactivity by collecting down-hole gamma measurements. No additional locations exhibiting elevated radioactivity were identified in the borings in the thicker fill areas outside the slips. No elevated gamma readings were noted in the borings drilled in Slip C near the northwest corner of the site. One additional area was identified in Slip E and five additional areas were identified in Slip D.

In summary, based on the results of the investigations previously completed by STS, the radiologically impacted soil appears to be restricted to two localized areas. These areas are within or in close proximity to the former locations of Slips D and E. The volume of impacted soil identified using the data developed, and including several assumptions that would tend to overestimate the amount of impacted soil, resulted in an estimate of 1,136 cubic yards (CY) (STS, February 2002). However, subsequent excavation and grading activities may discover additional soil beyond that identified in the previous explorations. That material may also possibly require removal.



### 2.0 PROPOSED WORK ACTIVITIES

## 2.1 General Description

There are three phases of work that comprise the investigation and remediation of the Subject Site. The Initial Investigation and Delineation Phase (Phase I) has already been completed. The Investigation and Delineation Phase started with the survey and sampling work conducted by USEPA and/or STS and reported in the USEPA July 2, 2001 letter report and the STS September 2001. October 2001 and February 2002 reports. A summary of the Phase I results was provided in Section 1.1. The scope of work for Phases II and III comprises the work described in this Work Plan and summarized below.

The Radiologically Impacted Soil Removal Phase (Phase II) will consist of the removal of the radiologically impacted zones identified in the Initial Investigation and Delineation Phase. The Phase I results indicated that with one exception (boring number D-71) the impacted soil was confined to depths less than 10 feet. Therefore, the excavation and removal phase will remove impacted soil above the groundwater table, which is anticipated to be at a depth of 8 to 10 feet at the Subject Site. Removal of impacted material below groundwater, which would include material at depths greater than 10 feet, is not proposed since these deeper materials, if present, are shielded sufficiently by the overlying soil and/or groundwater to minimize the exposure hazard at the ground surface.

It is acknowledged that if radiologically-impacted soil remains at the Site following completion of this work, Lakeshore East will work with USEPA regarding the required documentation relative to this residual impacted material. At present, in the absence of knowing whether material will be left, at what location, on private or public property, depth, quantity or activity, determination of the appropriate document is not feasible.

The Subject Site will be graded in preparation for construction activities. The Site-wide Grading and Monitoring (Phase III) will involve radiological surveys of those areas that are covered by greater than 2 feet of post 1900 fill soil as the areas are exposed during the site development grading process. These post 1900 fill areas are shown on Figure 4. The Phase III activities will involve the grading of fill soils in thin lifts (18 inches maximum), which because of fill thickness, may have shielded the presence of radiologically impacted fill material during the initial surficial survey. Therefore, surficial surveys will be performed throughout the grading process in areas were post-1900s fill soil greater than 2 feet thick is present. Any soil above the cleanup threshold of 7.1 pCi/g total radium will be removed to clean limits, and the impacted location confirmed clean through confirmation surveys and verification sampling by



USEPA. The determination that an impacted location has met the clean-up criteria will be made through analysis of soil samples to measure the soil concentration of contaminant radionuclides. A more detailed description of these activities is presented in the following sections.

## 2.2 Excavation of Radiologically Impacted Soil (Phase II)

Excavation will proceed in two phases, radiologically impacted soil removal (Phase II) and the site-wide grading and monitoring phase (Phase III). Phase II will consist of the removal of the radiologically impacted soil identified through the site walk-over gamma survey and boring programs previously completed and summarized in the STS reports of September 2001 and February 8, 2002. Those soils will be removed to apparently clean limits of 7.1 pCi/g total radium or less. The excavations will be designated Exclusion Zones for purposes of health and safety requirements.

The excavation process will utilize an excavator with a maximum one CY bucket. This bucket size will facilitate loading the transport containers without spilling and/or spreading the contamination. Impacted soil will be loaded directly into transport boxes. Transport boxes will be lined, covered, and sealed, and the exteriors confirmed clean prior to leaving the Subject Site, in accordance with SOP-320 (Appendix B).

At locations where impacted soil is covered by clean soil, excavation will be limited to not more than 18 inches per lift followed by a survey for elevated gamma readings. This restriction is due to the shielding provided by soil, which could preclude detecting impacted soil beneath a soil cover of greater than 18 inches. Excavation will proceed to excavate the impacted soils at the Subject Site. The excavations will proceed to clean limits and will be confirmed by surveys conducted during the excavation process. Once the confirmation survey has confirmed the absence of radiologically impacted soil (SOP-210), the excavation will be subject to verification survey and sampling by USEPA, in accordance with Section 3.2.3 of this Work Plan (SOP-223 and SOP-214 of Appendix B).

If floor slabs are encountered within the post-1900 fill materials, the slab will be broken and removed and the soil beneath the slab screened for verification and closure by USEPA. Concrete slabs, footings or walls encountered during the excavation will be cleaned of adhering contamination, if any, and after release by USEPA as non-radiologically impacted, will either be removed from the site or stockpiled on-site for subsequent management in connection with site development work.



## 2.3 Site Grading and Monitoring (Phase III)

The Subject Site will be graded in preparation for construction activities. Phase III will involve the surveying for radioactivity of post 1900s fill soil that, because of fill thickness, may have shielded the presence of a radiologically impacted soil during the Phase I surficial survey. Surficial surveys will be performed as grading proceeds in the areas where the post 1900 fill is in excess of 2 feet thick. These post 1900 fill areas are shown on Figure 4. All impacted soil will be removed to clean limits. Grading will be limited to lifts of 18 inches or less between surveys.

Former building foundations or buildings with basements built after 1900 have not been identified at the Subject Site. However, if discovered during the grading process, the potential presence of radiologically impacted fill materials below the floor slab or basement floor and any fill materials within the basement will be investigated. For the materials within the basement structure the radiological survey methods will be similar to those used for the excavation process (i.e., investigation in maximum 18 inch lifts through the full thickness of the basement fill). For soil below the floor, the method of investigation will consist of the complete removal of the floor and a subsequent surficial survey. The discovery and subsequent investigation of such structures will be included within the closure report for the Subject Site.

## 2.4 Construction Monitoring

Radiation monitoring will continue during site development and construction as part of the following activities:

- · Utility installation; and
- Foundation excavations in certain areas of the site.

## 2.4.1 Utilities

The installation or excavation of utilities will occur during the grading and subsequent construction phases. Utility excavations will be screened for the presence of radiologically impacted materials when the utility activities are proposed for areas containing post-1900 fill materials which have not been previously surveyed. These areas will be limited to the shipping slip areas shown on Figure 1.

These surveys will be conducted following the methodology for excavation of apparently clean soil in Sections 2.2 and 2.3. Excavation will be limited to not more than 18 inches. All impacted soils will be removed to clean limits or to the depth of groundwater, which is anticipated to occur at a depth of about



10 feet. Areas containing impacted soil above the 7.1 pCi/g cleanup threshold will remain designated as Exclusion Zones until the area is verified clean by USEPA. Work within any utility installation area designated as an Exclusion Zone will require appropriate personal protective equipment (PPE) and personal air monitoring. Personnel entering Exclusion Zones must be 40-hour health and safety trained. All equipment and personnel that enter an Exclusion Zone will be frisked clean upon leaving the area.

#### 2.4.2 Foundations

Drilled or excavated foundations may be installed in post-1900s fill materials, and will be screened for radioactivity during the grading and subsequent construction phases. Spoil from drilled foundations will be screened for the presence of radiologically impacted materials when the drilling activity is proposed for an area containing post-1900 fill material, such as in the slip areas. Radiological surveying will be limited to these fill materials. Natural soil excavation and drilled spoil will not be surveyed for radioactivity. Spoil materials exhibiting a radiological impact above the 7.1 pCi/g cleanup threshold will be managed for disposal according to Section 3.3. The closure report will provide the location, if any, of impacted material identified during these drilling activities that will remain on-site.

Foundation excavations will be screened for the presence of radiologically impacted materials if the excavation activities are proposed for areas containing post-1900 fill materials. These surveys will be conducted following the methodology for excavation of apparently clean soil in Sections 2.2 and 2.3. Excavations will be limited to not more than 18 inches between surveys. (Note that the 18 inch limit will not apply to any caisson or other drilled foundation elements due to the construction methods for such features.) Impacted soils will be removed to clean limits or to depth of groundwater (i.e., about 10 feet). Areas containing material above the 7.1 pCi/g cleanup threshold will remain designated as Exclusion Zones until the areas are verified clean by USEPA. Work within an area designated as an Exclusion Zone will require appropriate personal protective equipment (PPE) and personal air monitoring. Personnel entering Exclusion Zones will be 40-hour health and safety trained and all equipment/personnel will be frisked clean on leaving the area.



#### 3.0 METHODS

## 3.1 Cleanup Threshold

The USEPA has set the cleanup level as 5 picocuries per gram (pCi/g) total radium (Ra-226 and Ra-228) above the background. A level of 2.1 pCi/g total radium is currently considered background for the area by the USEPA. Thus, radiologically impacted material is defined by the USEPA for the Streeterville area as exceeding a threshold of 7.1 (pCi/g) total radium.

Field measurements will be taken of gamma radiation levels using a Ludlum 2221 rater-scaler and a 2 x 2 NaI detector. The equipment will be calibrated to determine the gamma count in counts per minute (cpm) that is equivalent to 7.1 pCi/g. Equipment calibration will be performed using the thorium calibration blocks at the Kerr-McGee West Chicago Rare Earth Facility.

Field measurements of gamma counts will include the following:

- Surveys of excavation as clean overburden is removed;
- Surveys of excavation as radiologically impacted soil is removed;
- Surveys of excavations to document all impacted soil has been removed;
- Surveys of Phase III grading as 18-inch lifts are removed;
- Surveys of utility or foundation excavations; and
- Surveys of deep foundation excavations or drilling spoil.

### 3.2 Surveys, Sampling, and Analysis

## 3.2.1 Confirmation Surveys

Confirmation screening surveys will be conducted during the excavation of fill materials previously identified as radiologically impacted in the STS reports of September 19 and October 2, 2001 and February 8, 2002. Excavated locations will be screened in accordance with SOP-210 (Appendix B). Since evidence of radiologically-impacted soil in excess of the 7.1 pCi/g cleanup threshold has been identified, these areas will be designated as Exclusion Zones. As described in the Health and Safety Plan (HASP) and discussed briefly in Section 4.0, the Exclusion Zones will require appropriate personal protective equipment (PPE) and personal air monitoring to enter. All equipment and personnel that enter an Exclusion Zone will need to be frisked clean upon leaving the Exclusion Zone. Personnel entering Exclusion Zones must be 40-hour health and safety trained. The surveys will be conducted using a Ludlum 2221 rater-scaler and a 2 x 2 Nal gamma detector.



The areas of potentially impacted soil that have not been documented as clean will be surveyed in place. Excavation will proceed in lifts not to exceed 18 inches in thickness. If an increase in gamma radiation is noted on the order of twice background values, excavation will proceed in thinner lifts to minimize the potential for mixing clean and radiologically-impacted soil. Excavation will proceed through the potentially impacted fill material using an excavator with a maximum bucket of one CY. This bucket size will facilitate loading the transport containers without spilling and spreading the radiologically impacted soil contamination. The subsample locations will be obtained by dividing the 100 m² area (10-meter x 10-meter) into four equal quadrants of 5-meters x 5-meters. Four of the subsamples will be collected from the center of the 5-meter x 5-meter quadrants. The fifth subsample will be obtained from the center of the 10-meter x 10-meter sample area. Sample collection will be in accordance with SOP-214.

Once the confirmation screening indicates the absence of radiologically impacted material above the cleanup threshold, samples will be collected over a maximum 100 m<sup>2</sup> area for confirmation analysis at a laboratory. Five subsamples will be composited to develop the sample for each 100 m<sup>2</sup> area. Analysis will be either by NUTRANL or gamma spectroscopy. After confirmation analysis shows the area to be clean, the area will be subject to verification surveys and sampling by USEPA, in accordance with Section 3.2.3 of this Work Plan. The excavations will not be backfilled until a signed radiological verification closure form is received from USEPA.

Soil screening during the course of the excavation activities is also intended to minimize the incorporation of clean material in that which is designated for disposal. Soil indicative of levels below 7.1 pCi/g total radium by the confirmation screening process prior to excavation will be staged for potential use as backfill. As previously indicated, excavation will proceed using an excavator with a maximum 1 CY bucket. This bucket size will also allow the excavated soil to be screened a second time before being placed on the backfill pile. This potentially non-impacted soil will also be subject to verification surveys and sampling by USEPA, if requested, in accordance with SOP-214 (Appendix B) and Section 3.2.3 of this Work Plan.

Imported fill soil will be tested to confirm it meets the criteria specified in Specification 02200, Section 2.E. Material will be tested for radioactivity (less than 3.7 pCi/g), engineering classification per ASTM D2487, and Standard Proctor per ASTM D698. One series of tests will be performed for each 10,000 cubic yards from a single borrow source. One series of tests will be provided for each borrow source at a minimum.



Prior to the initiation of Phase II or Phase III activities, gamma count rate background levels shall be established for each applicable survey instrument. Six locations shall be chosen in non-radiologically impacted areas of the Site. A one-minute integrated count shall be obtained at the surface of each location, for each survey instrument (Ludlum 2221 with 2" x 2" Nal probe). The measurements collected from each location shall be averaged to establish instrument specific background gamma count rates.

In order to establish background gamma dose rates, a measurement shall be obtained at one meter above the surface of each of the six background locations. A Ludlum Model 3 with attached 1" x 1" Nall probe will be used to record the uR/hr reading at each location. The measurements shall be averaged to establish a background gamma dose rate for the Site.

## 3.2.2 Surficial Walk-over Surveys

Surficial survey methods were used in Phase I of this project to initially identify the presence of radiologically impacted materials. This same technique will be used during Site-wide Grading and Monitoring (Phase III) to survey for the presence of contamination. Additionally, those areas currently covered by pavement and/or buildings that precluded the survey of exposed soil, will be subject to walkover surveys. If necessary, paving stones, asphalt, concrete and the associated subgrade will be removed prior to conducting the surficial survey. A grid with a 5-meter spacing will be marked by stakes and flagging at the edges of the project area or by paint on the ground surface on the interior of the site. The areas between the grid points will be scanned so as to cover 100 percent of the intra-grid areas.

The surveys will be conducted using a Ludlum 2221 rater-scaler and a 2 x 2 Nal gamma detector. The detector will be unshielded to provide for a broader screening area in assessing the surface survey. Values will be recorded in counts per minute (cpm). The maximum value will be recorded for each grid cell and all anomalously high areas (2 times background) will have the approximate limits designated on the survey data sheets. The locations will be marked in paint on the ground surface. Field screening data sheets will include recording the instrument serial number, calibration date, operator, and site grid coordinates surveyed. A copy of a field data sheet is attached (see Appendix A).

Locations with elevated gamma counts (twice background) will be marked to identify the limits of the elevated readings. Those areas which exceed the USEPA cleanup level, gamma counts indicative of material exceeding 7.1 pCi/g total radium, will be designated as Exclusion Zones. Work activities within the Exclusion Zones will be conducted in accordance with the procedures outlined in the HASP and briefly summarized in Section 4.0.



Additional documentation of contaminant levels may be performed through the collection of samples for laboratory analysis using high resolution gamma spectroscopy analyses. Gamma spectroscopy samples will be collected in 500 ml Marinelli beakers and submitted to a subcontract laboratory for analysis. These samples may be collected to: a) document where removal is necessary; b) indicate areas where removal has been successful; ca) document areas that are below the USEPA threshold level as indicated by the Nal detector; or db) to confirm the levels of radiological contamination that will remain on-site outside the designated excavation areas.

## 3.2.3 Verification Sampling

As previously indicated, soil exhibiting contamination above the clean-up threshold of 7.1 pCi/g total radium (Ra-226 + Ra-228) will be removed, placed in transport boxes and shipped to a disposal facility licensed to receive this material. Excavated locations will be screened in accordance with SOP-210 (Appendix B). To demonstrate to the USEPA that the floors and sides of soil excavations meet cleanup criteria specified by USEPA, a verification/field sampling program must be implemented following the excavation of the radiologically-impacted materials. The verification survey sampling program will be conducted in general accordance with SOP-223 and SOP-214 (Appendix B).

The excavations will not be backfilled until a signed radiological verification closure form is received from USEPA. Initial field demonstration that the location has been excavated to clean limits will be made with a shielded 2 x 2 Nal detector. Pre-verification samples will then be collected and analyzed using NUTRANL software and gamma spectroscopy analyses. It is anticipated that the NUTRANL software and gamma spectroscopy analyses will be conducted at an off-site (fixed) laboratory. This fixed facility will either-be at a temporary laboratory established in the vicinity of the Lakeshore East site or at a and will be supervised by Mr. Glenn Huber of Stan A. Huber Consultants, Inc. of New Lenox, Illinois. Samples may also be sent for high resolution gamma spec analysis to a subcontract laboratory operated by RSSI in Morton Grove, Illinois. The laboratory data package will include chain-of-custody copies, sample receipt and tracking forms, preparation and analysis logbooks, raw data forms, tabulated data summaries, calibration records, and standards, QC sample results, and any corrective action reports (refer to SOP-364 in Appendix B). Gamma spec analysis will be conducted using a Library Energy Tolerance of 1.2 keV and a Gamma Fraction Limit of 71%.

The option to use a temporary field laboratory for generating the gamma spectroscopy verification data could be utilized if rapid turn-around of results becomes critical to the project. Field lab verification results



would be provided in two forms. The initial NUTRANL data set will consist of one set per sample and will include the radionuclide concentrations and error limits for uranium 238, thorium 232, radium 226, and potassium 40; the sample number; date and time sampled; laboratory number (sequential); identify the analyst; and analytic method (NUTRANL). The second field lab data form will be a consolidated spreadsheet with all analysis in sequence by laboratory number. This table will include the sample number, data and time sampled, radionuclide concentrations and error limits for the four NUTRANL analytes, and a line totaling the thorium and radium concentrations. The field laboratory will also maintain a copy of the chain-of-custody for those samples received and analyzed.

## 3.3 Materials Management

Activities to manage removed material include all actions taken from the time the material is excavated until it reaches its final destination. Materials that are removed from the property may be replaced in their original locations, placed in another location on the property, salvaged, or sent to a local landfill if the materials meet the radiological clean-up criteria of 7.1 pCi/g total radium. Materials that do not meet the radiological cleanup criteria will be sent to an approved disposal facility.

At present, it is anticipated the radiologically-impacted material will be sent to EnviroCare of Utah, located in Clive, Utah. Shipping and placarding will be in accordance with all Department of Transportation regulations for shipping radiologically-impacted material. Permitting for disposal at EnviroCare will be arranged before any impacted material is loaded for shipment.

Trash and debris that is not radiologically-impacted and is designated to be removed from the site will typically be placed into clean roll-off containers provided and collected by licensed trash removal and disposal companies. Radiologically-impacted materials will be transported between the Subject Site and the approved disposal facility according to DOT regulations. Procedures which will be used with respect to radiologically-impacted materials to minimize the potential for and effects of spills and accidents during transport of such radiologically-impacted materials include but are not limited to the following:

- Drivers will have the proper licenses, training, and certifications for transporting potentially radioactive materials.
- Trucks transporting low-level radioactive materials in excess of 7.1 pCi/g total radium will have sealed or lined containment. Covers for the roll-off containers will be placed over the load prior to exiting the contaminated area. Covers will be fastened down tightly to prevent materials from being blown out of the containers. This will minimize the escape of materials should an accident occur. Empty containers returning to the site will also have covers. Trucks will carry all



necessary papers and placarding. Containers will be inspected prior to loading to determine suitability.

- Contaminated vehicles and equipment will be decontaminated first using broom cleaning to remove all adhering surface dirt. As needed, pressurized water spray will be used for further decontamination. Water generated during decontamination will be contained and evaporated, or used for dust control on contaminated soils designated for disposal, or possibly sent for disposal at an approved disposal facility.
- Prior to transporting excavated soils or other materials, all transport equipment will be frisked. Frisking will include tires and fenders and the sides and back of the bed. Frisking the cabs of trucks will not be necessary unless loading has been over the front of the truck.
- Travel between the property and the rail terminal will be only on specified routes selected to minimize the potential for and the effects of any accidents.

Two types of material will be distinguished in the excavation process: radiologically-impacted soil exceeding the clean-up threshold of 7.1 pCi/g total radium, and excavated soil suitable for backfill that is not radiologically impacted in excess of 7.1 pCi/g total radium. There also may be materials that will be specified by the owner as unsuitable for backfill, based on engineering properties, non-radiological impacts, or other specifications. For this Work Plan, a distinction is proposed for radiologically-impacted materials and non-radiologically impacted materials. Disposal of non-radiologically impacted materials at an off-site location will comply with all applicable laws and regulations.

Soil that, based on visual or olfactory observations, is suspected to be grossly impacted by non-radiological contamination will be temporarily staged on-site to allow for proper sampling and characterization for disposal. These soils will be placed on liners and will be covered to minimize potential for erosion and spread of the material.

Radiologically-impacted soil excavated in Phase II will be loaded directly into containers (either "Baker Boxes" or "Supersacks"). In Phase III, the anticipated quantities of material exceeding the radiological cleanup standard of 7.1 pCi/g total radium at individual locations may not fill a "Baker Box". In that is case, soil exceeding the radiological cleanup level will be temporarily stored in "Supersacks" until enough has accumulated to warrant delivery of a "Baker Box". Where locations are encountered during Phase III where significant quantities of radiological material require removal, direct loading of containers will be resumed.

#### 3.4 Data Management and Report



Data management for the site consists of site safety and training records, health physics data (i.e., air monitoring and personnel monitoring data), soil radioactivity field and laboratory data, shipping and transport records, and civil construction and excavation data (i.e., land surveys, excavation volume estimates, etc.). A vicinity or local laboratory will be used to analyze soil samples as excavation and removal proceeds, and for pre-verification sampling that the radiological clean-up criteria have been met. Analytical records will be kept at the site and at the STS office in Vernon Hills, Illinois. Air monitoring analyses will be maintained at both the site and the STS office, and will be transmitted with the monthly project progress reports to USEPA.

Monthly progress reports will be submitted to USEPA beginning 30 days after USEPA's review and approval of this Work Plan, and will be submitted monthly by the 15th of each month until termination of the UAO as applicable to this site, unless otherwise directed by the USEPA On-Scene Coordinator (OSC). These monthly reports will describe all significant developments during the preceding period, including the work performed, and any problems encountered, analytical data received during the reporting period, and developments anticipated during the next reporting period, including a schedule of work to be performed, anticipated problems, and planned resolutions.

### 3.5 Exclusion Zone Access and Security

Access by unauthorized personnel to the Exclusion Zone excavation areas will be controlled during operational and non-operational hours because of hazards created by open excavations, moving contractors' equipment, and traffic. Only authorized personnel will be permitted within the fenced area. Exclusion Zone access will be directed by the Project Coordinator, Field Team Leader or their designated representative (see HASP). The excavation work area will be fenced with a temporary chain-link fence unless the access is restricted by fencing at the site perimeter. In the case of a perimeter fence, access to the excavation areas will be restricted through the use of temporary fencing (i.e., plastic barrier fencing). This fencing will include appropriate signage to provide security during non-operational hours. Access gates/points will be closed when not in use.

During operational hours, the project management consultant, its contractors and subcontractors, and their representatives will have access to the excavation area to implement the excavation activities. The party responsible for radiological soil transport and their contractors and subcontractors will have access to implement health physics and transportation activities. Information on restrictions to the excavation areas, and various signs and barricades, will be disseminated during the project kick-off meeting held at the beginning of the project.



All visitors desiring access to the excavation area will be required to register with the Project Coordinator or his designee. The Project Coordinator or his designee will provide necessary orientation and training, provide radiation monitors as appropriate, and escort the visitors. The visitors will be required to observe all health and safety requirements and follow all instructions given by the Field Team Leader.

Regulatory and governmental officials who visit the excavation areas regularly will be requested to notify the Project Coordinator or the Field Team Leader. They will be required to comply with all Health and Safety rules.

During non-operational hours, barricades, beacons, radiation warning signs, and temporary fencing, as appropriate, will be placed to prevent unauthorized entry into an Exclusion Zone. Exclusion Zones will be surrounded with magenta and yellow rope and stakes or fence posts until determination that it meets the USEPA cleanup threshold. Signs will be placed on the excavation area perimeter fencing identifying the area as a construction area and prohibiting unauthorized entry. The warning signs will be installed at maximum 100 foot intervals on the perimeter fence.

#### 3.6 Decontamination

All discarded materials, waste materials, and other field equipment and supplies shall be handled in such a way to prevent the potential spread of contamination during excavation and restoration activities. Discarded items that have contacted contaminated materials will be containerized and stored for disposal at the approved disposal facility. Non-contaminated items to be discarded will be collected for disposal as general refuse waste. Personnel and sampling equipment decontamination are described in the Decontamination Procedure included as SOP-347 of Appendix B.



#### 4.0 HEALTH AND SAFETY PLAN SUMMARY

A project specific HASP is provided under separate cover. Site surveys, excavation and remediation activities will be conducted in accordance with the site HASP. Additionally, reference is made to the following documents included within Appendix-Appendices B and C:

- Dust Control Plan
- SOP-210 Gamma Radiological Surveys
- SOP-217 Excavation Procedure
- SOP-223 Verification Survey Procedure
- Construction Health and Safety

The HASP addresses required training, personnel protection equipment, general work precautions, and medical monitoring among other issues. In general, as contamination is detected, either by the initial surface survey or in the course of monitoring the excavations, the areas will be designated with a magenta and yellow rope and stakes or fence posts. These areas will be designated Exclusion Zones, and will require appropriate personal protective equipment (PPE) and personal air monitoring to enter. All equipment and personnel that enter an Exclusion Zone will need to be frisked clean upon leaving the Exclusion Zone. Personnel entering Exclusion Zones must be 40-hour health and safety trained.

All accidents or injury "near misses" will be documented and communicated to the Project Coordinator and Field Team Leader in a timely manner. Project safety briefings will be held on a weekly basis, and project tailgate meeting will be held on a daily basis as a regular part of project communication between the Field Team Leader and project contractors and subcontractors.

## 4.1 Key Personnel

While health and safety will be the concern of every person on the job, the radiation survey and soil excavation management team will be responsible for the implementation of the HASP. These persons are the Project Coordinator, Health and Safety Officer and the Field Team Leader. Figure 3 presents the project management work organization chart. The responsibilities for these positions are detailed in the HASP. Radiation laboratory subcontract services will be provided through Radiation Safety Services, Inc. (RSSI).





#### 4.2 Potential Hazards

Potential hazards that could be encountered during the removal activities include contaminated materials and the hazards associated with construction work. Contaminants of concern include the entire decay series for U-238 and Th-232. Radiological and air monitoring as described in this Work Plan will be performed during excavation to define the presence of radiological contaminants.

The mechanisms for exposure to the radiologically-impacted soil material are direct exposure, inhalation, ingestion and eye/skin contact. The primary mechanism of exposure is direct exposure to external gamma radiation. All workers will be instructed in appropriate measures to protect against exposure to the above materials, and PPE will be worn until monitoring shows such is not necessary.

Physical hazards which might be encountered at this site include but are not limited to the following:

- Construction equipment (front-end loaders, back-hoes, trucks, compactors, bulldozers);
- Power tools (saws, drills, jack hammers, compactors);
- Heat and cold stress;
- Overhead power lines;
- Excavations;
- Confined space;
- Noise:
- Demolition of structures;
- · Slip, trip and fall conditions, especially during wet or freezing periods; and
- · Buried utilities.

For this project, "utilities" include natural gas, water, sewer, communication, cable television lines, and electrical power distribution systems. Prior to the physical site survey, city and utility company records concerning location and construction of utilities on and in the general vicinity will be reviewed and consolidated on a single Utility Plan Drawing. The appropriate utility companies or their designees will be asked to verify the location by originating a request through the Chicago Utility Alert Network (DIGGER) phone number: 312-744-7000, and through application to the Chicago Board of Underground.

The locations of the identified utilities will be "ground-truthed" by observing the locations of power and phone poles, above-ground transformers (where electrical distribution lines are below ground), manholes, water meters, natural gas meters, phone boxes, surface indications such as utility vaults, catch basins, and surface depressions which can occur over utility trenches, and the locations marked by the utility companies or their representatives. Procedures for working in the vicinity of utilities and repair to



damaged utilities will be discussed with the excavation contractor crews. All work on and in the vicinity of utilities will be in accordance with City and utility company specifications.

Additional details on these and other safety provisions are addressed in the HASP.

## 4.3 Training and Communications

Site and project specific radiation and health and safety training will be provided for all on-site personnel prior to work on the Subject Site. All personnel required to work in the Exclusion Zone or Contamination Reduction Zone shall complete training conforming to the requirements of 29 CFR 1910.120(e) including 40 hours of initial hazardous waste site worker training. Where appropriate, they shall have 8 hours of annual refresher training, and 8 hours supervisors training. Field personnel shall complete radiation safety training in compliance with 32 IAC 400. This training shall include, at a minimum, 4 hours of training pertaining to radiation safety and awareness. Training will be conducted by a qualified safety specialist and/or a qualified senior health physics technician, at a minimum. The project training program is included in HASP. As noted in the HASP, Federal safety requirements take precedence over state requirements.

All site personnel will be trained and briefed on radiation basics, anticipated hazards, equipment to be worn, safety practices to be followed, contamination prevention practices, emergency procedures, radiation basics and communications. Procedures for leaving a contaminated area shall be planned and implemented prior to going on-site. Work areas and decontamination procedures will be established based on expected site conditions, and updated as necessary during construction. Other guidelines such as heat and cold stress, excavation safety and confined space are included within the HASP

In addition to this formal health and safety training, "tailgate" safety meetings will be held weekly, or more frequently, dependent on safety issues arising during the project. These meetings may be led by the worker's foremen and every employee must sign in before beginning work for the week. The subject covered and persons present will be recorded for each meeting and kept as part of the project records. Health and safety incidents and monitoring results will be discussed in the tailgate safety meetings, when appropriate.

Visitors to the site will be briefed on the requirements of the HASP before being allowed within the work area, and will be accompanied by a foreman or supervisor whenever possible.



## 4.4 Personnel Protective Equipment

Based on information from previous investigations of site conditions, radiologically impacted soil removal will be necessary. All personnel operating in Exclusion Zones will be required to have personal air monitors (PAMs). Disposable coveralls, steel-toed work shoes, boot covers, hard hat, safety glasses and gloves will also be required in all Exclusion Zones. Prior to exiting any Exclusion Zones, personnel will go through decontamination, disposal of all appropriate PPE, and frisking procedures as described in the HASP.

## 4.5 Air Quality Monitoring

The principal objectives of the air monitoring activities are to:

- Ensure worker and general population safety and provide radiological control information;
- Evaluate work procedures and site control measures. In addition to identifying the need for corrective action, air monitoring also documents the effectiveness of such control actions; and
- Measure releases of airborne radioactivity (should any occur) and ensure that people living and working in the surrounding area are not exposed to radiation above acceptable limits.

A primary requirement of dust control is "no visible dust" during activities associated with contaminant removal. The excavation, remediation and soil handling areas where impacted soil is present will be required to have no visible dust. Fugitive dust generation is caused by a range of activities including excavation, loading, dumping, transporting and scraping using heavy equipment such as bulldozers, front-end loaders, trucks and graders. Air monitoring will be conducted for the purpose of documenting and, if detected, initiating measures to control airborne contamination. Air monitoring will be conducted at both site and personnel levels.—If the initial dust control efforts are found to be ineffective, more extensive control-measures-will be taken. During the excavation and handling of radiologically-impacted materials, the procedures to be followed to control dust will include traffic speed control and use of covered Where possible, excavated contaminated materials will be loaded into the transport stockpiles. containers the same day they are excavated. Any radiologically-impacted material stored on-site will be either in containers or in Supersacks if there is not sufficient material to mobilize a container. Stockpiled clean materials, including excavated and imported borrow material, will be piled to minimize dust generation. Additionally, the covering of vehicles transporting borrow material will be required. If these initial efforts appear to be inadequate to control dust, water will be applied during the course of excavation and restoration activities as directed by the Field Team Leader to prevent, mitigate or reduce dust



resulting from excavation activities. The Dust Control Plan (Appendix C) provides additional detail on the control measures that may be implemented at the site.

## 4.5.1 Personnel Exposure Monitoring

All personnel operating in Exclusion Zones will be required to have personal air monitors (PAMs). Procedures for personal air monitoring are discussed in the HASP and SOP-212 (Appendix B). Lapel samplers worn for personal air monitoring will be utilized for airborne radioactivity monitoring. Air filters will be analyzed on a daily basis and additional evaluation of samples will be performed when determined necessary based on elevated results. Procedural changes or control measures, such as wetting of soils, will be employed prior to the prescription of respiratory protective equipment.

## 4.5.2 Perimeter Monitoring

Site perimeter monitoring will be conducted with high volume air samplers at the four sides of the site (north, south, east, and west). This monitoring will be at the property boundary or no more than 200 feet from the limits of the areas anticipated to be excavated. This air monitoring is for the purpose of documenting, and if detected, initiating measures to control off-site airborne contamination. Air monitoring will be conducted in accordance with the Air Monitoring Procedure, SOP-212 in Appendix B. Air filters will be evaluated on a daily basis for gross alpha activity. Comparisons will be made to 32-IAC 340 Appendix A 10 CFR 20, Appendix B, Table I and II to ensure that adequate radiological controls are in place for workers and the general public. Unless Illinois regulations are more stringent, 10 CFR Part 20, Standards for Protection Against Radiation shall be complied with. In such cases where Illinois regulations are more stringent, 32 IAC Section 340 shall be utilized.



## 5.0 CLOSURE DOCUMENTATION

An objective of the Work Plan is to document the identification, handling, and disposal of radiologically impacted soil encountered during construction activities at the Lakeshore East Site. The following types of data will be generated during the project:

- Surface gamma survey records
- Soil sampling records
- Soil sample field laboratory data
- Fixed laboratory soil analyses data (USEPA contract and STS subcontract laboratories)
- Air quality sampling records
- Air quality analytical data

The results of the Work Plan investigation and the removal work will be presented in a final closure report. The closure report will provide a summary of the locations of impacted material identified during the project, areas remediated, and identify any known areas where impacted soil remains on-site, if any. The report will include field data, laboratory results, documentation of the volume of material removed and its disposal location. The report will present the information as the basis for and will request issuance by USEPA of a "Certification of Completion Letter" for the Lakeshore East Site. The final closure report will be submitted within 60 days of completion of the on-site investigation and removal work.



### 6.0 REFERENCES

STS (February 8, 2002) Lakeshore East Additional Radiation Survey Investigation, Chicago Illinois, STS Project No, 1-32193-ZH.

STS (September 28 October 2, 2001) Addendum to Report: Results of Expanded Gamma Radiation Survey, 26-Acre Site, Chicago, Illinois—STS Project No. 1-32193-XH.

STS (September 19, 2001) Radiation Survey, 26-Acre Site, Southwest Corner of Wacker Drive and Lake Shore Drive, Chicago Illinois, STS Project No, 1-32193-XH.